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ABSTRACT

The fourth in a series of leaflets designed for dissemination of information on school building, this publication describes a caseworks subsystem consisting of storage systems, surface systems, plumbing and electrical services, and seating. The technical performance specifications for this subsystem and nine others were developed as a product of the Toronto School Board's Study of Educational Facilities (S.E.F.). The caseworks design consists basically of a series of containers, panels, and bases of various sizes on a 60-inch (1500mm) module. Square and rectangular containers, in nine modular sizes, are the basic building blocks of the subsystem. These can be arranged and attached in limitless configurations, and with the addition of subsystem accessories such as shelves, doors, and dividers, can adapt to specific functions demanded in schools. Because of this modularity, containers are moulded of rigid self-skinning polyurethane foam, as are library card catalogue drawers and container doors. Shelves are steel pans filled with light density urethane for strength and rigidity. (Photographs may reproduce poorly.) (Author/MLF)

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ff5

A CANADIAN "CASEWORK" OR FURNITURE AND EQUIPMENT SYSTEM FOR SCHOOLS

leaflet
by

PAUL LENSSEN

With the current evolution in teaching/learning methods and the rapid development of new educational technologies, furniture and equipment are if anything more important educational facilities than the school building itself. Furthermore, the kind of furniture and equipment needed and the way that built accommodation is planned and serviced are to a large extent interdependent. Yet too often the building is conceived and detailed with little certainty of how it will be furnished and equipped, while responsibility for the choice of furniture and major equipment may rest with a purchasing service which has little knowledge of modern educational requirements.

The subject of this leaflet, the free-form-five f.f.5 school case-work system, represents an unusual and highly successful response to the problems posed by this aspect of educational facilities provision. Its design was motivated by the Metropolitan Toronto School Board's Study of Educational Facilities (S.E.F.) whose broad objectives were to estimate the nature and direction of the changes facing the public education system in Metropolitan Toronto and, using this information, to recommend the kinds of school building facilities required to accommodate the needs of education both present and future.

S.E.F.'s research into current educational philosophy and practice culminated in a series of recommendations which reflect the fact that a school system, if it is to be effective, must adapt itself to the rapidly changing environment in which it functions. There was much consultation with many of the professionals engaged in every aspect of education which reinforced the view that students prefer to be active learners rather than passive receivers of information. Three reports dealing with educational specifications and user requirements were produced, one for each of the three levels of education: elementary, intermediate and secondary. These attempted to define the amounts and kinds of space required and described the various learning areas of the school and how these spaces might best be equipped to suit the learners. Library resource centres: space for co-operative teaching and for individual instruction: flexible organisation and time-tabling: access for the community: this is the 'total

flexibility' which emerged as the keynote of the study and was seen to be essential in facility provision in order that innovations might occur easily and spontaneously.

In putting the first S.E.F. Building System out to tender, S.E.F. prepared technical performance specifications based on its research into user requirements for ten building sub-systems constituting about 75% of the total cost of a school. (Foundations and site-work are examples of non-system items which make up the additional 25% of the cost). The objective of the bidding method was to retain competitive tendering while at the same time exploiting as far as possible the discrete and collective skills and resources of the building industry. Bidders submitted their prices for the design, development, testing, manufacturing, supply, installation and guaranteeing of all aspects of their sub-system proposal and were themselves responsible for the compatibility of their own sub-system with the other sub-systems with which it interfaced - when the parts of the one touch, pass through, or influence the performance of another in a finished building.

The ten sub-systems - of which the casework was one - were as follows:

1. STRUCTURE: including floor and roof-deck elements, spanning members, columns, etc., and provisions to accommodate the requirements of outside walls, lighting - ceiling and interior space division sub-systems.
2. ATMOSPHERE: heating, cooling and ventilation systems.
3. LIGHTING - CEILING: lighting fixtures and connections, acoustic installation, ceiling panels and provision for the electric/electronic sub-system.
4. INTERIOR SPACE DIVISION: fixed, relocatable and operable partitions, doors, panels, glass, chalkboards, tack-panels.
5. VERTICAL SKIN: outside walls, windows and doors.
6. PLUMBING: plumbing fixtures, washrooms.
7. ELECTRIC/ELECTRONIC: lighting panels, interior wiring, integrated P.A. (public address), fire-alarm, and communications systems.

8. CASEWORK: cupboards, counters, lockers, storage facilities.
9. ROOFING: roofing, insulation, skylights and miscellaneous details.
10. INTERIOR FINISHES: carpeting and gymnasium flooring, finishing hardware and blinds.

The use of performance specifications in the process of translation of educational requirements into the physical reality of the various sub-systems was of great significance and constituted a departure in principle from the more commonly adopted means of prescriptive technical specifications. After meetings with industry the S.E.F. technical staff and consultants prepared these performance specifications dictating as accurately as possible the results required without stipulating the material or the methods to be used in solving the problems posed. The development of the casework sub-system was no exception to this method and a number of nominated firms were invited to tender on the basis of several factors among which design and manufacturing capability were two of the most important.

Five major educational trends had emerged from S.E.F.'s earlier research all pointing to the need for ... 'flexibility in the systematisation of the design and use of caseworks as follows:

- the growing emphasis on the learning process and increased pupil learning activities
- the growing emphasis on the fostering of pupil creativity
- the growing need to enable schools to be used interchangeably by children and adults for all forms of educational programmes
- the growing emphasis on accommodating individual learning differences between pupils
- to encourage teachers and students to exploit the creative potentials of buildings which can be readily changed as a tool in the learning process.'

The tendering documents for the caseworks sub-system followed the same lines as those for the other sub-systems and consisted of: the contract documents: an explanation of the objectives of the sub-system; an outline of the scope of the work to be bid; the general requirements; specific requirements; and procedures for mock-ups, cost of connections and production prototypes.

The three main objectives were:

1. To ensure that the design and use of caseworks will interface with and complement the total design flexibility of the S.E.F. technical sub-systems (although it can be seen that in the case of this particular sub-system, interfacing was a minor requirement in the sense that the caseworks could be - and, indeed, subsequently were - used in non-S.E.F. buildings).
2. To ensure that the design and use of caseworks will support the increasing educational demands for variable sizes of learning spaces which will accommodate varying sizes of pupil groupings using many different forms of learning materials and equipment.
3. To provide the school boards in Metropolitan Toronto with the opportunity to purchase caseworks in a comprehensive and systematised fashion in order to effect greater economy; and to permit the interchange of equipment between the boards when required.

The scope of the sub-system was expressed briefly and in performance-oriented language as:

- storage systems for school supplies, information, equipment and personal belongings;
- surface systems for work, display activities and space dividers;
- plumbing and electrical services for activities requiring water, and local electricity, in the storage and surface systems;
- seating with its own specific - as it were - sub-sub-system specifications (SSB) with which the above systems and services had to interface.

Tenderers were asked in the section on general requirements to consider the systems of storage, surfaces, seating, plumbing and electrical services as components for making up caseworks in which the components and/or systems (singularly or in combination) could be assembled or adapted in an infinite number of ways to accommodate any permutation of school activity ... 'It shall be possible to disassemble, rearrange, expand, reduce or otherwise modify the component assemblies of the system to suit changing activities.' Other major factors to be taken into consideration were as follows:

- The possibilities of multi-functional components to reduce the number of different components required and simplify ordering and use, and lower manufacturing cost.
- The desirability of simplicity of design so that the systems can be operated easily and quickly by young students - preferably without the need for tools.
- Safety: the need for operation without danger to the users ... 'Coupling or adjustment methods shall be foolproof and function positively with minimum maintenance and without the chance of accidental release. This is particularly important for stacked, elevated or supporting type components.'
- Stability of erected assemblies to prevent tipping or falling over.
- Fire, smoke hazard and toxicity: tenderers were to submit their proposed testing and measurement procedures to the S.E.F. Director who, with the assistance of the responsible public officials, would establish standards.
- Colour: range to be submitted for evaluation; tenderers were to 'acquaint themselves with the approved colours for sub-system 4 (INTERIOR SPACE DIVISION) and interface their proposal.'
- Durability: marks due to cutting or scratching of the surface were to be easily repairable in-situ to return the surface to an acceptable condition. Low-cost, short-life units or surfaces were not ruled out but if proposed were to have a usable life of at least one year and have an amortised cost proportional to the twenty-year amortised cost (by debenture) of permanent furniture.
- Anthropometric data: tenderers were referred to the publication 'The Measure of Man' 2nd edition by Henry Dreyfuss, Whitney Publications, N.Y.C., which was to be used as a design guide for storage and surface heights and widths.
- Interfacing with the proposals of designated tenderers for other sub-systems.
- Sound control: materials, construction and design of all components to tend to reduce the propagation of sound, being sound degenerative rather than reflective in nature.
- Weight: solutions were to be sought having the lightest possible weight commensurate with the overall requirements of performance and economy.

- Pricing: a single unit price was to be given for each sub-system component and/or unit regardless of quantities which may be purchased at any time for any given order. Unit prices were to include for specified taxes, shipping, handling, packing, placing, assembly at the job site, adjustment, correction, removal of packing, etc.

Specific requirements given to the tenderers covered each of the storage, surface, seating systems and plumbing and electrical services and gave more detailed information regarding the points covered in the section on general requirements. For example, the specific requirements of the storage system were arranged under the headings: Inventory List (of objects normally found in various areas of the school): Library Card Catalogue Cabinet (to house the standard filing system for 3" x 5" library cards): Book Display; Book Supports; Lockers (for storage of personal belongings) etc., and those of the surface system: Horizontal Use; Vertical Use; Finishes; Projection Screen; Surfaces incorporating sinks and other utilities; Chart Stand; Study Carrels; Sight/Sound Separators; Fume Cabinets; etc. The specific requirements - as with the general ones - avoided technical prescriptive specification and were accompanied by a number of diagrammatic pages for the purposes of clarification. The drawings were purely to indicate the performance requirements and showed '<u>diagrammatic illustrations</u> only, not design.'

A Toronto firm, Cameron-McIndoo, was the successful tenderer for the caseworks sub-system with its free-form-five (f.f.5) proposals consisting basically of a series of containers, panels and bases of various sizes on a 60" (1500mm) module. These can be arranged and attached in limitless configurations and with the addition of sub-system accessories such as shelves, doors and dividers, car adapt to specific functions demanded in schools.

Containers, in nine modular sizes, are the basic building blocks of the sub-system. Because of this modularity, containers can be clipped to one another to form storage units. Solid or wire shelves can be placed in the containers and adjusted up or down in 2" (50mm) increments: these can also be used vertically in containers as

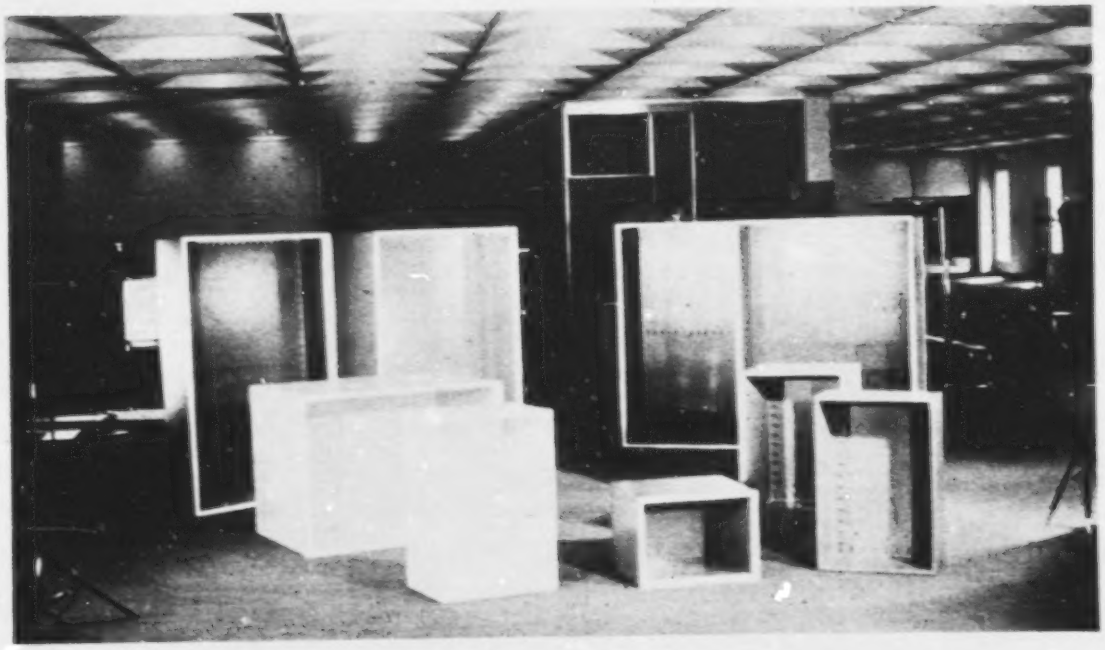

Figure 1 : The containers are the key components of the sub-system ranging in size from the smallest - 20" x 15" (500mm x 375mm) - to the largest - 40" x 60" (1000mm x 1500mm) - on the open side. They can be used open face up or down or on any of the sides.

dividers as well as horizontally as shelves. Other accessories available include plastic storage trays, magazine/book/audio-visual display racks and book ends. Doors - with or without locks - can be put on the containers and the whole assembly placed on pad bases for mobility on carpeted floors or on casters for extra mobility. Chrome bases with casters are provided which, in conjunction with containers, can form specialised mobile units; for example portable sinks or mail-box units. Most containers are moulded of rigid self-skinning polyurethane foam, as are library card catalogue drawers and container doors. Rigid polyurethane foam was chosen primarily because of its weight, impact resistance, and its ability to form monolithic parts. It was considered that more traditional materials simply would not have answered all the performance requirements and would not withstand the wear incurred by constant manipulation. Shelves are steel pans filled with light density urethane for strength and rigidity.

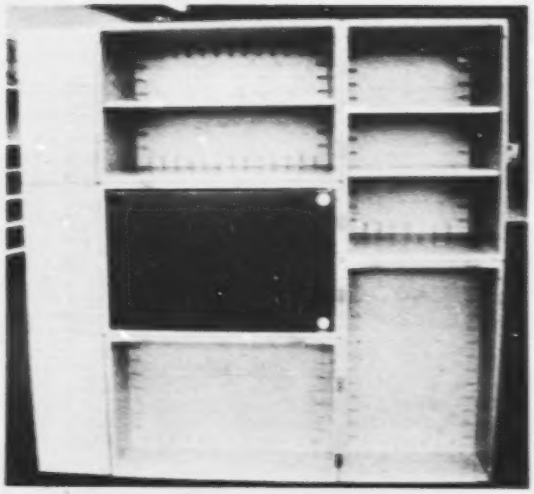

Figure 2 : Containers can be clipped together in a great number of ways. Here, in the Shepherd Glen School in New Haven, Connecticut, a group of containers is clipped together on top of a castered base to form a large, mobile storage unit which is usually situated in a central position in the teaching/learning space it occupies and accessible from all sides. It is interesting to note that, since the time of the original installation (when this photograph was taken), many of these large units have been taken apart and the basic containers used in a variety of alternative ways.

There are four sizes of panels available in the sub-system, each obtainable with various surface finishes; for example chalk, tack or plastic laminate. Panels, made up of a foamed urethane core between two plastic laminate surfaces, are light-weight yet strong. They can be used in combination with chrome bases to form tables or can be used vertically as writing surfaces or space division (although these last two functions are for occasional use only since they are mainly provided for in sub-system 4). In addition, the panels can be used as desk tops by using containers as pedestals, can serve as work surfaces on top of component assemblies, and can be arranged as display surfaces on the ends of containers. The chrome bases adjust in height from 18" (450mm) to 28" (700mm) in 2" (50mm) increments. The tables can be converted to study carrels by attaching carrel enclosures; wet carrels can be arranged with the addition of a power unit.

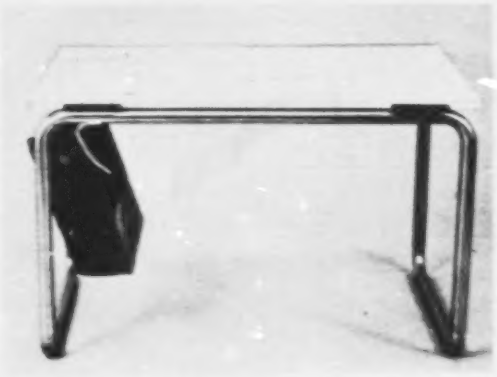

Figure 3 : 20" x 30" (500mm x 750mm) table with tote tray hanging from one side. The nickel plated chrome base adjusts in height from 18" (450mm) to 28" (700mm) in 2" (50mm) increments. The table top is slightly off-white to prevent it being a source of glare.

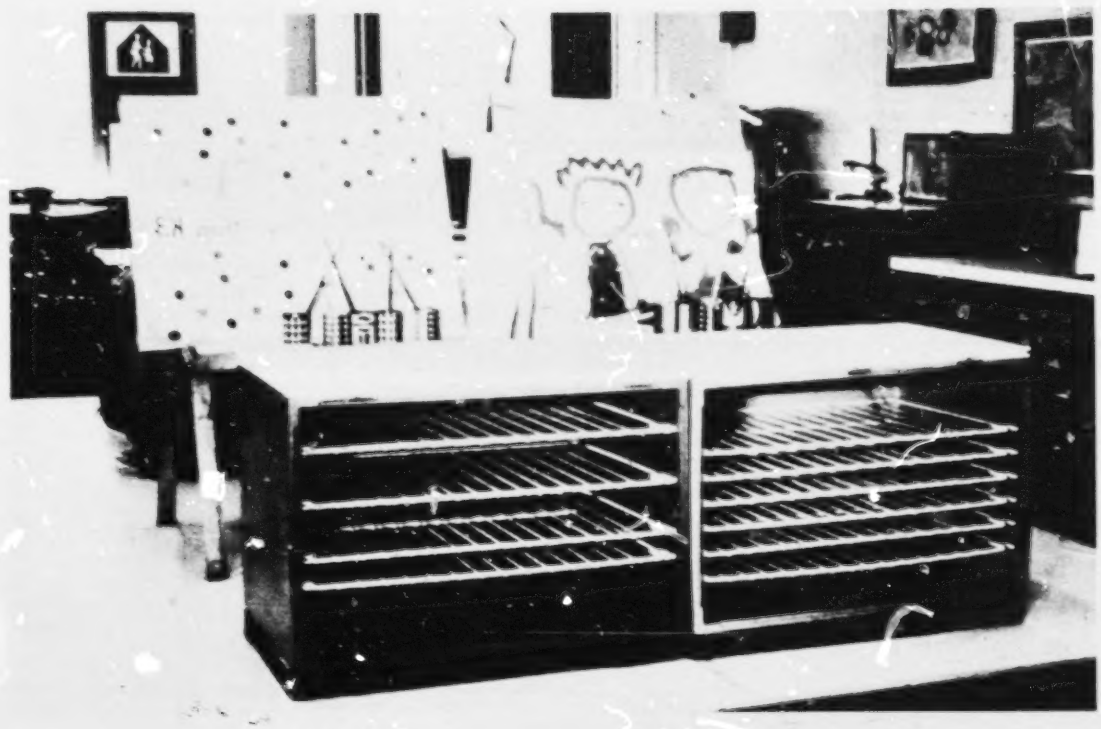

Figure 4 : Basic containers and panels clipped together to form 'paint stations.' Two containers are placed on a common base and a panel placed over. Wire shelves are fitted into the containers and these are used as drying racks for the finger painting or other types of painting that is done by the younger age groups.

Three further main items of a nature more specific than those already covered complete the kit of parts: coat racks, sinks and lockers/steel shelving. The basic coat rack unit is chrome plated steel tube with an integral wood seat. It has 12 hooks and adjusts from 40" (1000mm) to 70" (1750mm) in height at 6" (150mm) increments. Units can be free-standing, wall mounted or fastened back-to-back and wood shelves or containers for personal storage can be mounted on top. Plastic drip trays for boots are also available if required. Sinks are either fixed or mobile, the former having a stainless steel or urethane panel top with storage below and the latter a stainless steel top and 3½ gallon (approximately 16 litres) fresh water and 4 gallon (approximately 18 litres) waste tanks. Water flow is by a galley-type pump. Flexible connectors permit simultaneous refill and disposal when attached to

special adapters permanently fitted to fixed sinks or any other plumbing source. The lockers/steel shelving units can be free-standing, wall mounted or back-to-back and are manufactured in 60" (1500mm) modules divisible in 10" (250mm) increments to create six 10" (250mm) lockers, three 20" (500mm) cupboards, two 30" (750mm) cupboards, or any combination thereof. Foamed urethane core doors for silent operation are available for use of the units as lockers although without these they provide a useful steel shelving system.

It is interesting that, as store planners and designers, the firm which was awarded the sub-system contract had had wide experience in the use of open space and the general requirements of display and storage as well as modular systems in the field of shop fittings but none in the design, manufacture and supply of school furniture and equipment. The firm felt that this gave them an advantage in their approach to the design problems involved since they were not confined or conditioned by previous experience. The main reason for their decision to enter into the bidding was the opportunity presented by the S.E.F. programme of breaking into a new market which would in turn fulfil their need to have some sort of insurance for their business against the cyclical nature of the demand for shop fittings. This decision, they maintain, had been justified by the results. In the first two years of production, manufacture for the S.E.F. contract amounted to $1.4 million; in 1972 the firm embarked on a marketing programme resulting in sales of approximately 1.5 million in the first year with a 50% increase anticipated in 1973.

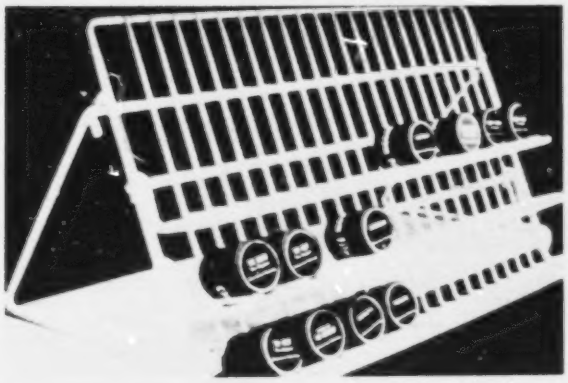

Figure 5 : Unit for storing film strips, cassettes and periodicals. Basically, the unit merely slides onto a shelf (or sits free-standing on top of a container or panel) and is made of vinyl coated or nylon coated wire.

The design team for the project consisted in essence of four people: two directors of the firm, one experienced in sheet metal and the other in wood; an expert in the use of plastics; and an industrial designer who was specifically employed for the project. Up to the point that they made the prototypes they relied on the performance specifications which had been given. The prototypes were submitted for comment and criticism by the teachers in the Toronto area boards and modifications subsequently incorporated into the design.

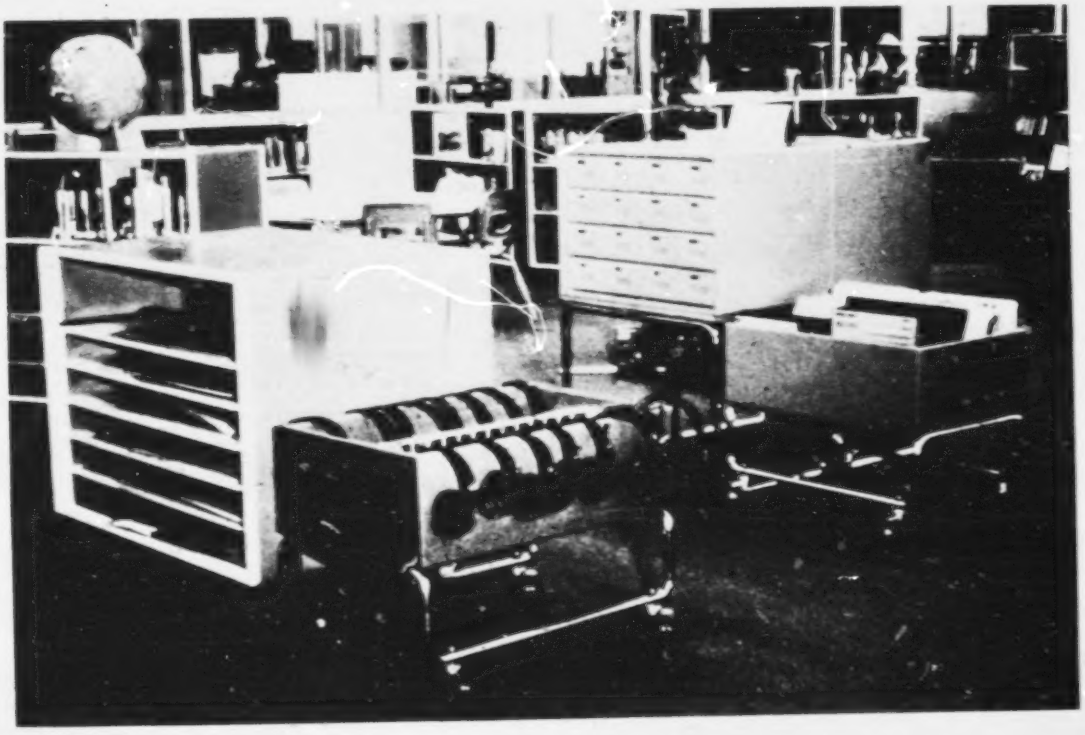

Figure 6 : Humewood Public School, Borough of York, Toronto: two mobile carts (in the foreground), identical yet used for two completely different purposes. The nearer one is used as a mobile A/V (audio-visual) cart whereas the other provides record/book storage. Also shown are containers used for large picture storage and for forming a card catalogue system.

None of the items in the sub-system has as yet become redundant but the demand for some - such as mobile sinks - has not been as great as initially expected. There have been minor criticisms: some teachers were not over-enthusiastic about the range of colours available; some librarians did not like the containers for books as they had fixed backs and consequently could not be seen through (hence causing difficulties of supervision); and other teachers thought that the tables were lighter, and therefore less stable, than they should have been - this criticism relating to their use by the older students. Most adverse comments, however, tend to be largely subjective in nature and are not significant in total number nor far-reaching in their relevance to the designs.

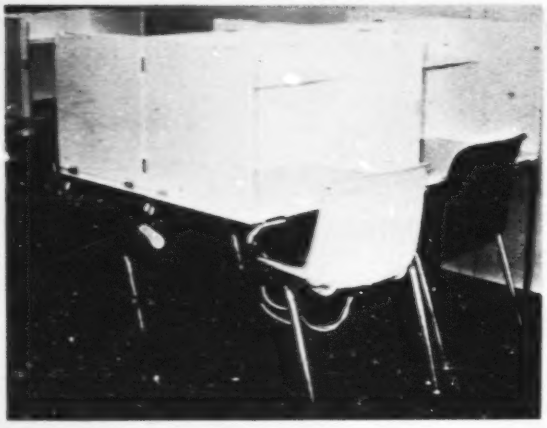

Figure 7 : Study carrels for individual learning. These clip directly onto the standard table and are available with electrical outlets if required.

In conclusion it is worthwhile considering what appear to be the differences in approach towards the design and production of mobile and moveable furniture between that adapted by the S.E.F. technical directorate and that by most other agencies engaged in this field.

The principal one is that in the latter case design tends to be directed towards individual items of furniture which have a specific purpose in the school; in the S E.F. performance specifications, however, the emphasis has been on the design of basic components which - with the addition of accessories - can serve a variety of storage and teaching needs. The corollary of this approach is that the S.E.F. casework system enables teachers and students themselves

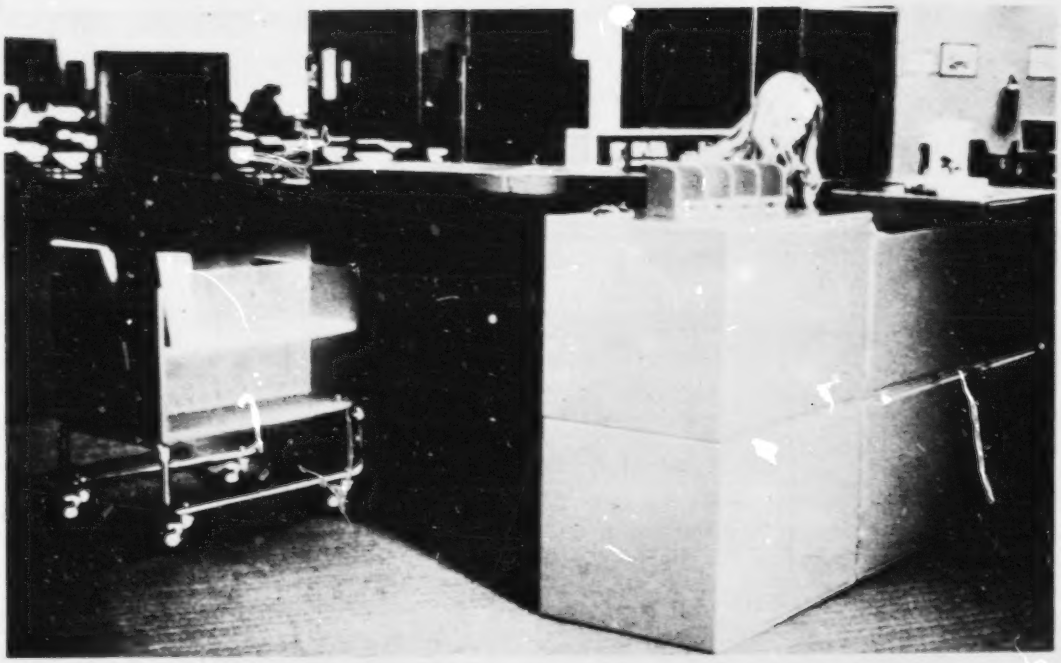

Figure 8 : Resource centre at Pleasant View Junior High School, North York, Toronto. Generally, such centres have a charge-desk or check-out centre which is often built-in as part of the general building work. In this instance, check-out or charge facilities have been formed by using the f.f.5 sub-system components.

to dismantle and re-assemble the components in ways that suit them best. This is without doubt a more flexible approach and one which would appear to be better suited to those elements in school furniture and storage facilities which do not have to incorporate detailed specialist requirements.

Figure 9 : Kindergarten area in Melody Village School, Etibicoke - one of the S.E.F. schools in Toronto. The basic containers are used for generalised storage of the many toys and other things that are found in a kindergarten area. The assembly of the sub-system components in this instance, as can be seen, is such that its scale is appropriate for the children - not massive or over-powering.

A further difference is that, as a rule, designs are undertaken by a selected group - architects, or industrial designers - which itself develops prototypes and only afterwards approaches the manufacturers for the requisite expertise and knowledge concerning problems of production, supply and cost. The S.E.F. method, in contrast, was to use the research ingenuity of a number of manufacturing concerns right from the outset of design and subsequent only to the preparation of the performance specifications. The latter approach has the

advantage of opening up the design process to a wider range of contributors possessing a greater variety of skills and thereby making possible the re-examination of problems - old and new - with fresh eyes.

Yet the nature of the manufacturing industry for the supply of school furniture is often such that the methods employed by S.E.F. are not necessarily universally applicable. The approach adopted could be valid only where there exists a reservoir of design ingenuity in firms which can be tapped, where new ideas are needed in design, and where the market - potential as much as actual - is such that firms can be persuaded to enter the lists of competition. Unless these conditions exist, the methods used in the case of the f.f.5 subsystem could well prove less fruitful than has been the case in Toronto.

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P.E.B. INFORMATION LEAFLETS

Issued by the O.E.C.D. Programme on Educational Building (P.E.B.), the leaflets are an attempt to circulate up-to-date information on interesting examples of innovatory school building activity. It is hoped they will serve to stimulate those engaged in the provision of school building facilities in their search for new solutions to new problems. Leaflets available to date (English and French versions) are:

1. School Building Today and Tomorrow
2. Maiden Erlegh : an English Secondary School Development Project
3. C.R.O.C.S. : a Swiss Industrialised School Building System
4. f.f.s. : a Canadian "casework", or furniture and equipment system for schools.

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